

## **SUBSTITUTE SPECIFICATION DESCRIPTION**

### **BACKGROUND OF THE INVENTION**

The invention relates to an apparatus for heating plastic pipes so they may be bent. More particularly, the invention relates to an apparatus that may be conveniently used in fieldwork to heat PVC plastic pipes, so that they may be bent and fitted on site.

It is known in the art to heat plastic pipe by enclosing it in a box and subjecting it to infrared energy supplied by electrical heaters. In addition, method and apparatus for bending tubes by applying heat to them are disclosed in U. S. Patent No. 3,965,715 to Parmann, U. S. Patent No. 2,571,416 to Brown, and U. S. Patent No. 2,480,774 to Rossheim, et al. The disadvantages of the prior art are that they may be inconvenient for use in the field or at some remote site where a source of electricity or other means for heating the pipe is unavailable.

U.S. Patent No. 6,033,213, issued on March 7, 2003, to Halverson, Jr. relates to an apparatus for bending plastic pipe, with a diffuser that is removable and interchangeable with an additional diffuser if needed for heating different schedule pipe. This apparatus is not insulated. The disadvantage of the interchangeable diffusers is that it not only takes additional time to allow the apparatus to cool down for those in the field to change the diffusers, it requires extra space for carrying and storage. As this apparatus is not insulated, it will take additional time for field personnel to handle the unit for extra bends and storage. In addition, this apparatus has one size inlet in which the pipe is to be placed. This can permit either too much or too little of the gases to escape. An increased amount of heat escaping defeats the purpose of the apparatus, by not minimizing the gas flow and decrease the heat retained, resulting in an ineffective or incomplete bend. A decrease in allowance of the gases escaping will result in the build up of internal pressure, resulting in enough pressure to blow back into the heat source, possibly damaging the heat source.

U.S. Patent No. 6,257,880, issued on July 10, 2001, to Hirayama describes an apparatus made of galvanized steel, on wheels or rollers, with an internal burner,

utilizing a heat source or propane gas. The present invention is distinguishable from this apparatus in that there is no need for an internal burner, which may easily break upon usage in the field. The present invention provides the capabilities of the use of a number of heat sources, although the object of the invention is to utilize the convenient use of the exhaust of a motor vehicle. The present invention allows for faster installation, permitting faster bends and less equipment to be taken out on the field. As in the previous U.S. Patent No. 6,033,213 this apparatus has but one size inlet for the pipe, allowing too much or too little gas/heat to escape. It is also noted that present invention is made of aluminum and lightweight and, alleviating the need for rollers or wheels.

U.S. Patent No. 6,561,797, issued on May 13, 2003 to Johnson describes and apparatus for heating rigid plastic pipe with a gas burner. The present invention allows thin walled and thick walled plastic pipe to be manipulated. Having an internal gas burner this apparatus may break or malfunction with usage in the field. The present invention permitting various heat sources.

### SUMMARY OF THE INVENTION

According to the present invention, a container or box is provided having openings in the ends to enclose a plastic pipe disposed through the box. A conduit is attached to the box and has an end adapted to connect to the exhaust pipe of a motor directed upon the pipe at the desired point to be bent. When the pipe is sufficiently heated, it will sag, it is then withdrawn from the box and bent in the usual and well-known manner.

The principal object of the invention is to supply the worker in the field with a durable, lightweight, self contained, portable source for bending thin walled and thick walled pipe.

It is also the object of the invention to supply a heat source that requires no electricity or propellants, that will heat up quickly, maintaining a proper temperature, and be able to be handled immediately after or during use, with the ability to cool down quickly for convenient storage.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a top perspective view of the apparatus of the invention,  
Fig. 2 is perspective view of the conduit fitting,  
Fig. 3 is an internal top sectional view of the apparatus of the invention, and  
Fig. 4 is an internal end sectional view of the apparatus of the invention.

## DETAILED DESCRIPTION OF THE EMBODIMENT

Referring now to Fig. 1, the apparatus of the invention is indicated generally at 1. An elongate container or box 2, with handle 3, is provided for surrounding the section of PVC pipe to be bent. The container preferably includes openings 4 formed through the ends 5 of the box, the openings being sized to permit positioning the pipe to be heated through the container 2, by use of templates 7. The lid 6 permits containment of hot exhaust gases in the container 2. A fitting 8, which may be any configuration although an elbow fitting is illustrated here, is provided mounted through an opening 9 in a side 10 of the container.

Referring now to Fig. 2, a flexible conduit 11 is connected to the fitting by any suitable means and has its opposite end adapted to engage the exhaust pipe 12 of motor vehicle 13. The various means of connection will be dependent upon the size of the motor vehicle's exhaust pipe 12.

Referring now to Fig. 3, in the preferred embodiment, a diffuser 14 is mounted in the internal container 19 and may consist of a longitudinally extended U shaped sheet of metal attached to the internal container 19 by welding or other practical means such as screws 15. The diffuser 14 is located so that the exhaust gases exiting from the through-fitting 8 impinge upon the diffuser plate and not directly upon the pipe to be bent. Spot heating of the pipe is therefore prevented and the hot gases are dispersed and caused to flow around the pipe for more uniform heating. Depending upon the type and thickness of the pipe to be bent, the diffuser may vary in length or construction and may include openings 16 there through, all of which is considered a part of the present

invention. Insulation 18 permits internal retention of heat, deterring outside heating of outer container 2.

Referring now to Fig. 4, in the preferred embodiment, a diffuser 14 is mounted in the internal container 19. This may consist of a longitudinally extended U shaped sheet of metal attached to the internal container 19 by welding or other practical means such as screws 15. The diffuser 14 is located so that exhaust gases impinge upon the diffuser plate and not directly upon the pipe to be bent. Spot heating of the pipe is prevented and hot gases are dispersed around the pipe for uniform heating. Insulation 18 permits internal retention of heat, deterring outside heating of container 2.

Referring now to Fig. 5, templates 7 with various sized openings 20, 21, 22, are provided to maintain internal conditions within the apparatus. The template used will be dependent upon the schedule of pipe to be bent. The appropriate templates are slid into the distal ends of the container 2, between the side 5 and the inner box 19. Templates are utilized to control gas flow from the container, maintaining the proper temperature and internal pressure.

In the use of the invention, a pipe to be bent is placed in the container and positioned so that the centerline of the portion of the pipe where the bend is to be made is positioned opposite the fitting 8. The end 17 of the flexible conduit is then slipped over the exhaust pipe 12 of the motor vehicle and the motor vehicle's engine is started. The hot exhaust gases flow through the conduit and the fitting and strike the diffuser in the box where they are dispersed to surround the pipe through perforations 16. When the pipe is sufficiently heated to be bent, which condition may be determined by the pipe becoming limp and starting to sag, or grasping an end of the pipe and moving it to determine the softness of the section in the container, the pipe is slid horizontally out of either distal end of the apparatus. Whereupon it may be bent by hand or by the use of jigs, or other means such as are known in the art. Upon cooling, the pipe will retain the bent configuration and it may be carried to the jobsite for connection in other plumbing/electrical conduit bodies.